Seabasing Science & Technology Update

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22 July 2014

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Purpose/Agenda

Purpose: to provide a brief update of the work being done by Seabasing technology development community. Detailed briefings of several capabilities will be presented during the working group that follows

Agenda:

- Office of Naval Research (ONR) Portfolio Overview
- Future Naval Capabilities
- Other technologies of note
- Challenges

Working Group:

- Start time -1430
- Location - Claxton Logistics

Working Group Agenda

Science &Technology/Research & Development Track		
Time	Topic	Lead
1330-1400	S&T/R&D Overview	Mr. Barilich
1400-1430	Move Claxton	--
1430-1445	Introduction, Goals & Objectives	Mr. Barilich
1445-1500	Naval S&T Gaps	Mr. Andy
1500-1530	OST&E OAG Uniform Priority List	Ms. Mangum
1530-1545	DPART	Ms. Kerrigan
1545-1615	ROAMS Update	Mr. Padula
1615-1645	ONR Update	Dr. Main
1645-1700	PEO Ships Update	Mr. Rausch
1700-1730	Discussion, Road Ahead	Mr. Barilich

Technology Readiness Levels

TRL

9. Actual system proven through successful mission operations.

8. Actual system completed and qualified through test and demonstration.

7. System prototype demonstration in an operational environment.

6. System/subsystem model or prototype demonstration in a relevant environment.

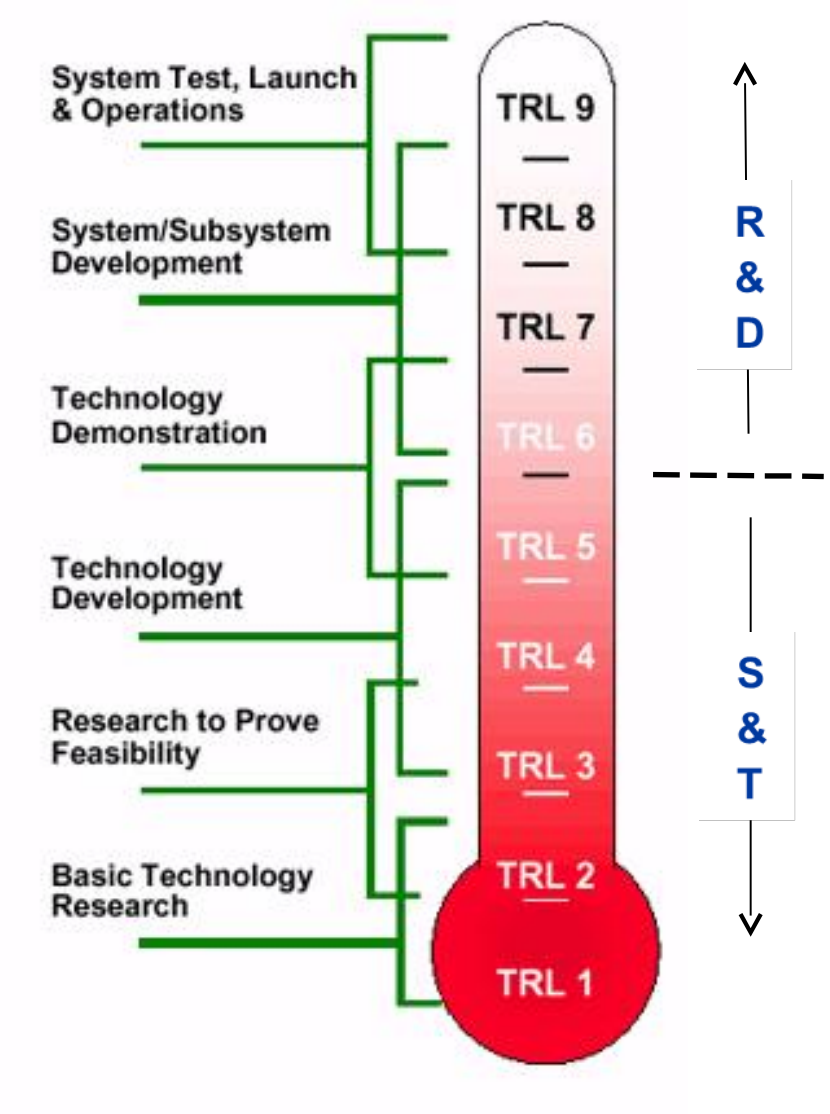
5. Component and/or breadboard validation in relevant environment.

4. Component and/or breadboard validation in laboratory environment.

3. Analytical and experimental critical function and/or characteristic proof of concept.

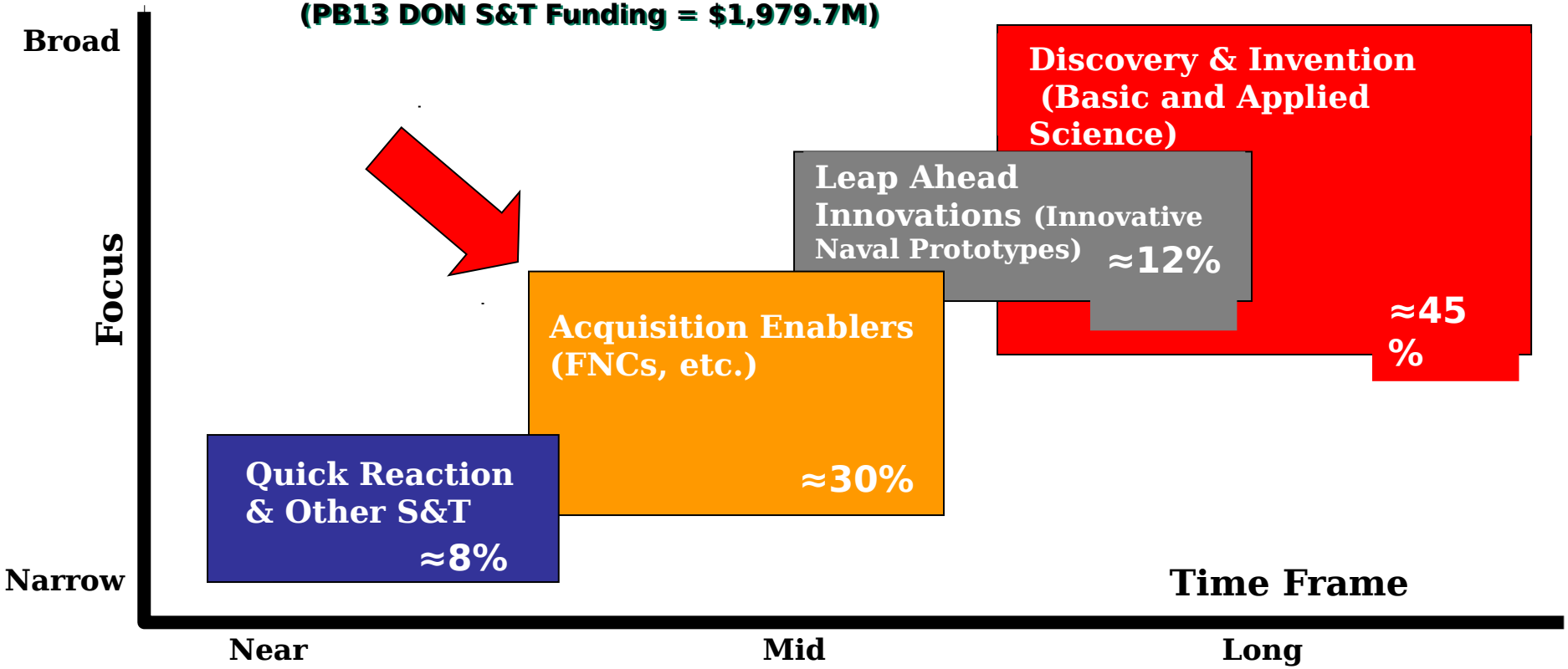
2. Technology concept and/or application formulated.

1. Basic principles observed and reported.



DoN S&T Portfolio Focus

PB15 DON S&T Funding = $1,916M
(PB13 DON S&T Funding = $1,979.7M)



Quick Reaction

- Tech Solutions
- Experimentation
- MC S&T (MCWL, JNLW, etc.)

Acquisition Enablers

- Future Naval Capabilities
- LO/CLO
- Other Acquisition Enablers

Leap-Ahead Innovations

- Innovative Naval Prototypes
- NSPs
- Swampworks

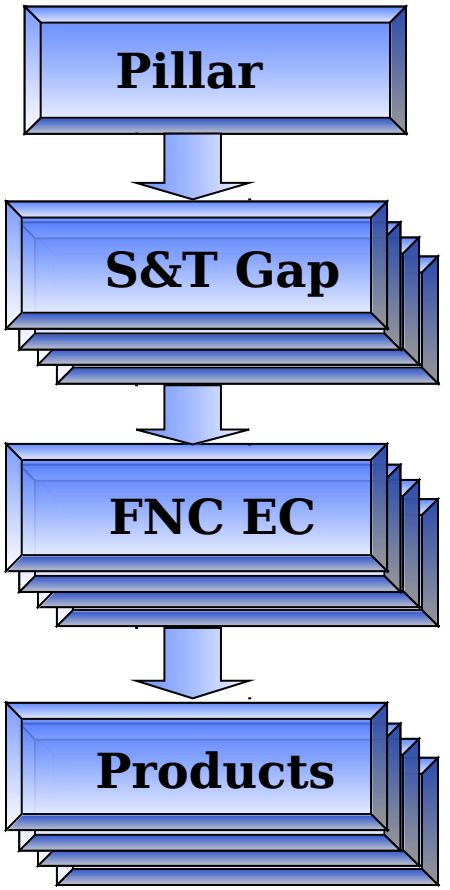
Discovery & Invention

- Basic & Early Applied Research
- National Naval Responsibilities
- Education Outreach

Future Naval Capabilities Program

The FNC Program:

- **Aligns to warfighting and supporting Pillars**
- **Responds to validated S&T Capability Gaps (requirements)**
- **Consists of Enabling Capabilities (ECs)**
- **Delivers FNC Products (prototype systems, knowledge products, technology improvements) after meeting pre-negotiated exit criteria**



The FNC program is composed of Enabling Capabilities that develop and deliver quantifiable technology products in response to validated S&T Gaps, which are approved by the Technology Oversight Group for insertion into acquisition

FNC Pillars

- **Sea Shield** - Missile defense, ASW, MCM and fleet/force protection technologies -- global defensive assurance.

- **Sea Strike** - Weapons, aircraft, and expeditionary warfare technologies -- precise and persistent offensive power.

- **Sea Basing** - Logistics, shipping, and at-sea transfer technologies -- operational independence.

- **FORCEnet** – C4ISR, networking, navigation, decision support and space technologies -- architectural framework for naval warfare in the information age.

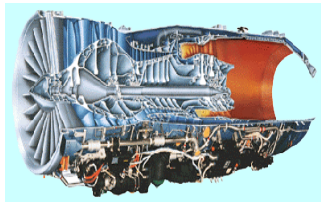
- **Naval Expeditionary Maneuver Warfare** Enhance the warfighting capabilities of naval ground forces with special emphasis on regular and irregular warfare.

FNC Pillars

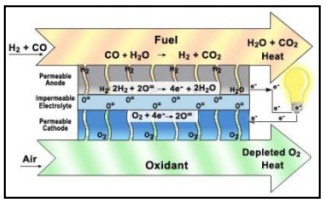
- **Capable Manpower** - Match Sailors and Marines to the right jobs, design intuitive systems, and train for mission essential competencies.

- **Force Health Protection** - Protect Sailors and Marines by reducing morbidity and mortality when casualties occur.

- **Enterprise and Platform Enablers** - Cross-cutting technologies to lower acquisition, operations, and maintenance costs.



- **Power & Energy** - Energy security, efficient power and energy systems, high energy and pulse power.



Technology Oversight Group (TOG)

TOG ★★★

- Co-Chairs: N8 / MCCDC
- Permanent Members: PMD ASN (RDA), DCOM USFF, N091/CNR, N2/N6, ***MARFORCOM***
- Equity Members: N1, N4, N093, Deputy CNOs and Deputy Commandants
- N84 Executive Secretary

TOG Working Group

- 0-6/GS-15 Level Representatives of Each TOG Member
- Interacts with IPTs and makes

Sea Shield

- OPNAV N86
- MCCDC
- USFF N803
- PEO LCS
- ONR 32

Sea Strike

- OPNAV N87
- HQMC Aviation
- USFF N8
- PEO U&W
- ONR 35

Naval Expeditionary Maneuver Warfare

- OPNAV N85B
- HQMC PP&O
- USFF N8
- MCSC
- ONR 30

Sea Basing

- OPNAV N95
- DCG MCCDC
- USFF N804
- PEO Ships
- ONR 33

Power & Energy

- OPNAV N45
- USMC HQ E20
- USFF N8
- NAVSEA 05
- ONR 03T

FORCEnet

- OPNAV N2/N6F
- Dir HQMC C4
- NETWARCOM
- SPAWAR 07
- ONR 31

Enterprise & Platform Enablers

- OPNAV N8F
- HQMC I&L
- USFF N433
- NAVSEA 05
- ONR 33

Force Health Protection

- OPNAV N931
- TMO, USMC
- FFC N02H
- NMSC
- ONR 34

Capable Manpower

- N15
- USMC TECOM
- USFF N1D
- NAVAIR TSD
- ONR 34

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- Other technologies of note
- What happened to …
- Challenges

Interface Ramp Technologies (IRT)

Objective

Develop and demonstrate an advanced light-weight ramp capable of loading/unloading people and combat vehicles between a JHSV and a pier, MLP or RRDF. Ramp will be operable in SS3(T) and SS4(O) and will meet the requirements of the current JHSV ramp in regards to footprint and electrical interface. Current JHSV ramp has SS1 limitations.

History

- Phase I, November 2006: LMSR - MLP ramp
- Phase II, October 2008: Redirected to JHSV - RRDF ramp
- March 2011: Requirement for ABS certification added.
- November 2013: Ramp load test
- December 2013 – Functional demo at Oceaneering
- April 2014 – Dynamic vehicle testing
- Apr - May 2014 – Limited technology experiment at OII

Transition

- Technology transition to OPNAV N42 for inclusion in analysis of alternatives for a Sea State 3 ramp for JHSV.

Way Forward

- June – Sep 2014 – Disposition and close out of S&T.

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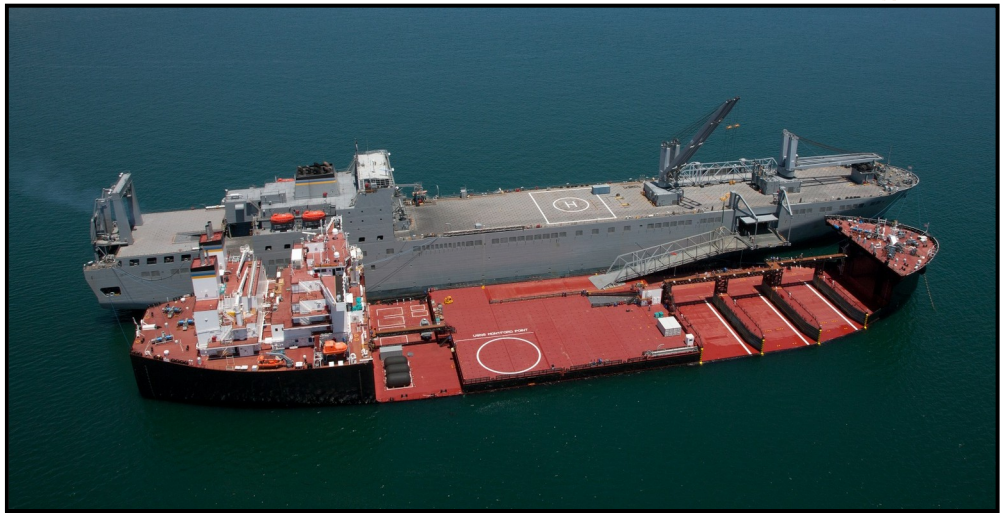
Environmental and Ship Motion Forecasting (ESMF)

Objective/Relevance:

An open-architecture, common interface system to assist shipboard operators in making go/no-go decisions for shipboard ops, such as:

- skin-to-skin ship mooring and fendering evolutions
- inter/intra-ship cargo, personnel and vehicle movement
- launch and recovery of manned or unmanned air and sea vehicles

System will use shipboard sensing and computing assets to predict wind, waves, and resulting ship motions.



Technical Ideas/Approaches:

Technology Areas:

- Wave field sensing
- Wave/wind field reconstruction
- Multi-ship motions measurement/prediction
- Decision Support System/Operator Guidance

Ship speed: 5-10 knots
# of Performers/Systems: Two
Prediction Time:
Specific Wave/Wind events: 30 seconds
General environmental conditions: 5 minutes
Ship type:

Ship Type:

- MLP, LMSR, T-ACS, T-AKE, JHSV, LCAC, any ship doing launch & recovery

Sea State: SS5, swell and wind-driven waves
Water depth/Shoreline obstructions: Unobstructed blue water

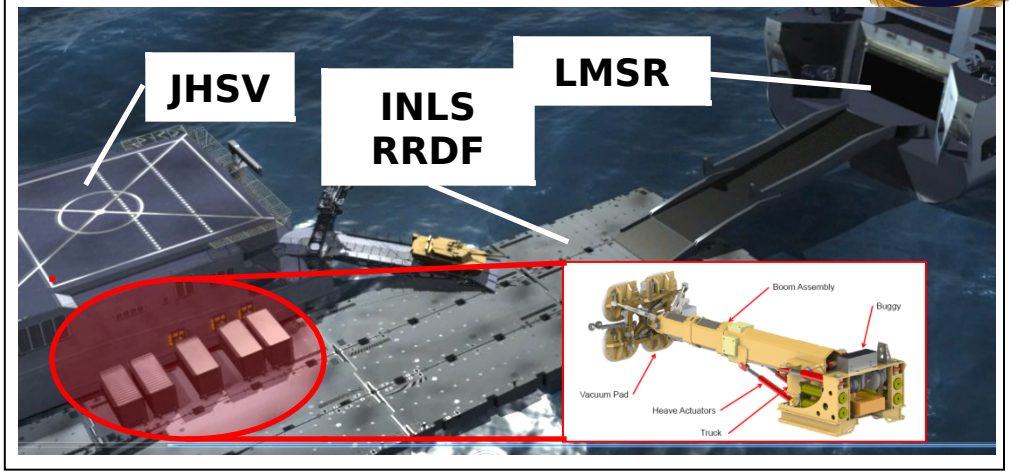
Payoff:

- Significantly increase the safety and extends the operational envelope of sea-based operations from sea state 2-3 to 4-5.
- Guidance output will improve effectiveness and safety of existing/legacy, planned and envisioned transfer and launch and recovery systems.
- Provides high-fidelity inputs to METOC global

Advanced Mooring System (AMS)

Technical Description:
Automated, safe, and rapid mooring and positioning of connectors alongside the INLS RRDF (demo) and connectors and ships alongside the MLP (simulation) for the purpose of at-sea transfer of payloads, mission modules, material, equipment, and personnel through the application of sensors, control algorithms, and responsive actuators.

TRL at Start: 3 **TRL at Transition: 6**



Key Events:

- Q1 FY13 – Q2 FY14 Model Scale Testing
- Q1 FY14 Detailed Design Complete
- Q3 FY14 ABS Approval of Design
- Q4 FY15 Full Scale Land-Based Testing
- Q2 FY16 Full Scale At-Sea Demonstration
- Q3 FY16 Transition to R&D

Challenges:

- Attaching to Light Weight Hull Structures
- Tracking and Matching Target Motions for Capture
- Identifying and Avoiding Protrusions and Hull Openings
- Accommodating a Wide Range of Hull Shapes and Curvatures

Warfighting Payoff:

- Supports Expeditionary Force 21
  - Force Multiplier for Connectors
- Seabasing JIC - Quickly / Safely moor connectors and high flare container ships to the MLP in high sea state
- CNO and CMC - Interface JHSV above SS 1 (current capability).
- Enable JHSV and MLP to moor alongside other MSC, Navy, commercial, and coalition ships/platforms.
- Permits mooring of Navy, MSC, coalition, and commercial ships at-sea to enable transfers of mission packages, equipment, personnel, and payloads

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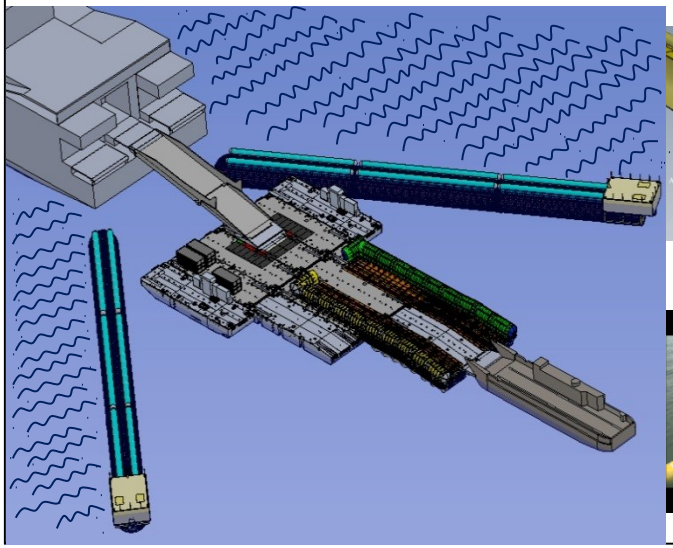
Other requests shall be referred to Dr Geoffrey Main, The Office of Naval Research (ONR) Code 331

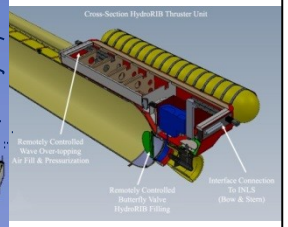
Flexible Sea-based Force Projection (FSFB)

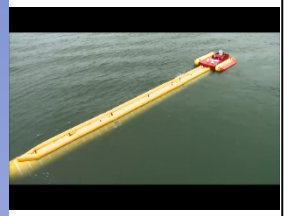
Product Description:

- Innovative rigid inflatable (air/water) structures to create
  - Wave containment barriers to reduce the local sea state near the Sea Base
  - Components that will join existing seabasing interface components to land LCAC/SSC; dock LCU 1600/2000 at Float

TRL at Strct: 3 TRL at Transition: 6




Cross-Section HydroRIB Thruster Unit
Remotely Controlled Wave Over-topping Air Fill & Pressurization
Remotely Controlled Butterfly Valve HydroRIB Filling
Interface Connection To INLS (Bow & Stern)



Planned Demos/Transition

- Acquisition POR/Contact: USMC Prepo, NAVFAC SSPO/Paul Bode
- Resource Contact: N95, CDR Cannon
- Key Demonstrations: Full scale component test & evaluation (Q3FY18)
  Final test and Demo (Q4FY19)
- Final Transition (FY19)

Warfighting Payoff:

- Access to entire Prepositioned Force in Seabase
- At-sea transfer operations enabled through SS3
- Provides a landing platform for LCAC/SSC and reduced sea states for other connector operations

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Ultra Heavy-lift Amphibious Connector (UHAC) 1/2 Scale Test Results

Highly Successful Demonstration (6Sep12)

- Larger scale mobility performance verified
  - Speed/ power (Re-affirmed)
  - Stable open-ocean transit and 360 rotation maneuver
  - Landing on 25 degree slope, debris-laden shoreline
- Verified infinitely variable transmission low-speed maneuvers and high-speed sprint operation

DC CD/I and Director SID observe demo April ’14

Recent Demonstrations & Tests 11 July 14

- ½ Scale UHAC participated in RIMPAC ’14 with operations in well deck USS Rushmore, thru surf and across the beach; multiple payloads
- Craft will conduct mud-flats testing in Oahu later this summer

FOUO: Not Approved for Public

UHAC Half-Scale Demo
07/11/14 During RIMPAC/AWE

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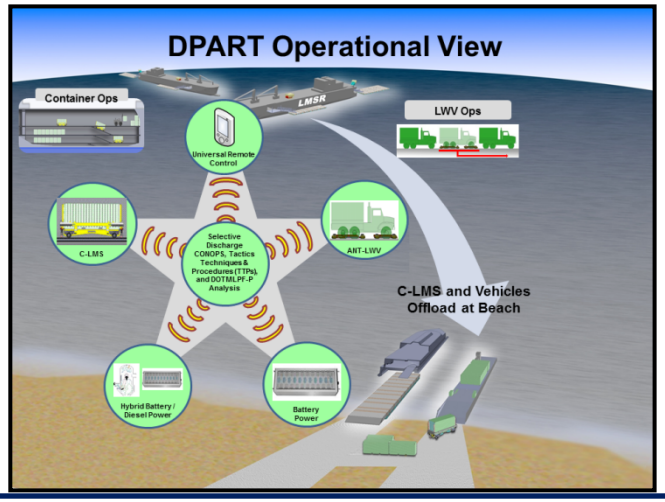
Dense Pack Access Retrieval and Transit (DPART)

COCOM Sponsor: PACOM/TRANSCOM; **OE:** Lenny Lopez

FY13

Operational Problem: Commanders lack capability to quickly project, selectively access, reconstitute and redeploy flexible, scalable and tailorable forces and logistical support across the range of military operations from prepositioning ships (LMSR).

OV-1:



Specifics:

•Year 1: Design, engineering, and fabrication of Diesel C-LMS Component technical demonstrations at contractor's site as they are completed. Technical demonstration of Diesel C-LMS at contractor's site. Design, fabrication, programming, analysis and testing of universal remote control (URC) and universal battery compartment. Initiate design, engineering, long lead items procurement and fabrication of ANT-LWV.
•Year 2: Limited Operational Utility Assessment 1 (LOUA) of Diesel C-LMS. Complete fabrication of ANT-LWV. Technical demonstration of ANT-LWV. LOUA 2 of the ANT-LWV and URC on LMSR pierside.
•Year 3: OUA of Diesel/Hybrid C-LMS, ANT-LWV, and URC at [illegible]

Transition:

•Semi-Autonomous pre-production operational systems following Technology Demonstrations in FY 14-15.
•Transition lead is NSWC-CD.
•Strategy is to transition components to GSA Schedule.
•Lead service is USMC.

Requirement:

- Addresses USTRANSCOM Science & Technology Integrated Priority List (STIPL) item Global Mobility/Access: Enhance from the sea/over-the-shore delivery capabilities by pursuing Seabase connectors/interfaces to enhance air-sea, sea-sea, and sea-shore flow of forces, equipment and materiel, continue Service efforts that reduce logistics footprint, and develop systems that ensure unfettered global access.
- Seabased vessels, specifically prepositioning ships, cannot dense pack or selectively access and retrieve cargo and equipment, specifically twenty-foot equivalent unit (TEU) International Standard Organization (ISO) containers and large wheeled vehicles (LWV) for operations requiring a partial off-load or specific items.

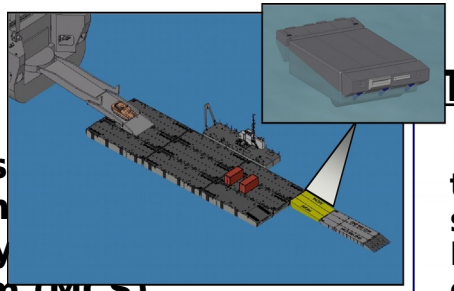
Competing Capabilities:

- Vessel lift-on/lift-off crane operations and roll-on/roll-off operations using Rough Terrain Container Handler (RTCH) and fork lifts. These operations are limited to very low end SS-3 environmental conditions. RTCH cannot move containers up and down internal

Technologies:

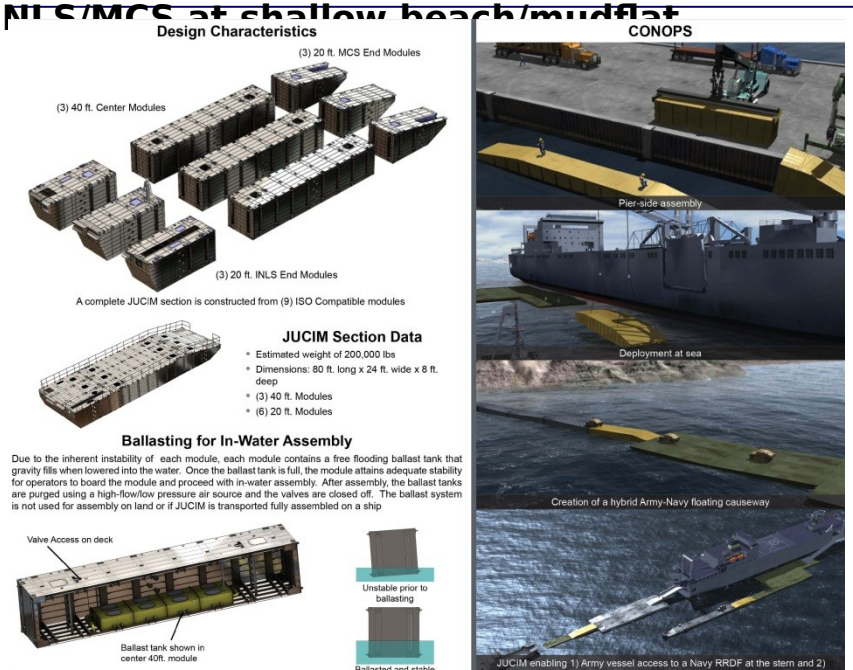
•ANT-LWV
•C-LMS
•URC
•Battery Power Modules

Joint Universal Causeway Interface Module (JUCIM)



Description:

Establishes a compatible connection (that compens for the difference in heigh between the current Army Modular Causeway System (MCS) and the Improved Navy Lighterage System (INLS) to create interoperability when configured as a Roll-on-Roll-off Discharge Facility (RRDF) or Causeway Pier; and use to span variable height quay wall/port pier or compliant connection for INLS/MCS at shallow beach/mudflat


Design Characteristics
(3) 20 ft. MCS End Modules
(3) 40 ft. Center Modules
(3) 20 ft. INLS End Modules
A complete JUCIM section is constructed from (9) ISO Compatible modules
JUCIM Section Data
Estimated weight of 200,000 lbs
Dimensions: 80 ft. long x 24 ft. wide x 8 ft. deep
(3) 40 ft. Modules
(6) 20 ft. Modules
Ballasting for In-Water Assembly
Due to the inherent instability of each module, each module contains a free flooding ballast tank that gravity fills when lowered into the water. Once the ballast tank is full, the module attains adequate stability for operators to board the module and proceed with in-water assembly. After assembly, the ballast tanks are purged using a high-flow/low pressure air source and the valves are closed off. The ballast system is not used for assembly on land or if JUCIM is transported fully assembled on a ship
Valve Access on deck
Ballast tank shown in center 40ft. module
Unstable prior to ballasting

CONOPS
Pier-side assembly
Deployment at sea
Creation of a hybrid Army-Navy floating causeway
JUCIM enabling 1) Army vessel access to a Navy RRDF at the stern and 2)

Tech Trans Plan:

- **JUCIM will be designed for integration and transition into current and future causeway systems of record in the Army/Navy. The PM's for INLS & PD AWS have been contacted to coordinate the incorporation of JUCIM in their respective POR's upon test & evaluation and end of project.**
- **JUCIM will be designed to interface/connect with existing INLS & MCS, and potentially Lightweight Modular Causeway System (LMCS).**
- **JUCIM operational testing to be included in Joint Flexible Access from the Sea (JFAS) FY15 JCTD proposal.**

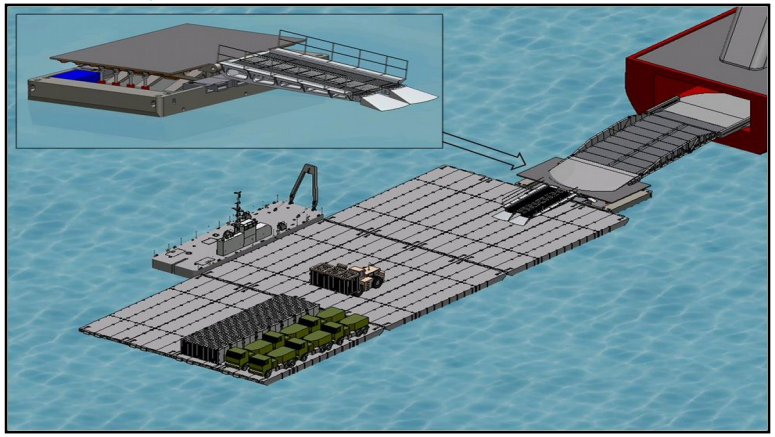
ROI:

- **Links existing and mature technologies reducing development costs**
- **Increases operational flexibility**
- **Increases throughput capability**
- **Throughput increased 28% (based on a 24 hour period with MCS RRDF in SS2+ utilizing 2 LSVs, 4 LCU 2000s and INLS in a typical JLOTs operation 1 mile from shore.)**
- **INLS FC with MCS Trident Pier-head creates SS2+ causeway with fewer sections than separate installations.**

POC: Dr. Frank Leban/NSWCCD/301-227-4698

Dr. Jimmy Fowler/ERDC-CHL/601-634-3026

Roll-on/Roll-off Interface Motion Platform



Description: Motion compensation interface platform for use with Ready Reserve Force (RRF) RO/RO's to enhance cargo throughput of military unit equipment at sea. Establishes an interface platform for the transfer of equipment between a RRF or commercial vessel and a service JLOTS RO/RO Discharge facility (RRDF).

Proposed Execution: FY14 - FY17

Requirement/JCA: Global Access: Seabasing JIC/Log 4.1.1; Log 4.1.2; Joint Logistics (Distribution) Tasks 2.0, 3.1, & 3.2

Benefit/ROI: Allow complete interoperability of RRF and commercial RO/RO ramps with JLOTS/Seabasing facilities at a fraction of the cost required to modify existing RRF ramps. Enhance the interface between JHSV and MLP using existing JHSV SS1 ramp. Potential LCU interface.

Collaborating Organizations: NSWCCD, Oceaneering International, Inc, Cargotec USA, American Bureau of Shipping (ABS)

Command Project Lead/Submitting Organization: TCJ5J4-I/ NSWCCD

POC: Dr. Frank Leban, frank.leban@navy.mil

Purpose/Agenda

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- **Future Naval Capabilities**
- **Other technologies of note**
- **What happened to …**
- **Challenges**

Challenges (Today)

- **Seabasing's initial price tag scared DOD away**
  - **(… relative to perceived value vs. "real" value)**
- **Technology Transition**
  - **Shipbuilding program(s) stability (daily effort to maintain)**
  - **Post-delivery technologies smack into the "threshold v. objective" wall (progress in this area)**
- **Seabasing's "enabling" v. "warfighting" status**
  - **Relevance to the current OEF fight (shifting with EF21 and new capabilities in the water)**
  - **Long lead time (8-10 years?) to deliver the technology (still true)**
- **The Seabasing community has been slow to come together**
  - **Current fight takes precedence; Differing priorities by services**
  - **BUT there is a definite convergence underway (good progress thru Seabasing WG's and the SOAG)**
- **What's the difference between a test, a demo, an experiment, and an LOE? (2014 a banner year; 2015 should surpass it due to operating force's initiatives)**

Reason for Optimism…

- **Operating forces exercise programs incorporating Seabasing concepts and technologies**
  - **Bold Alligator, Freedom Banner, T-AKE EX 14-1&2, Pacific Horizons, MPF EX, Native Fury…etc.**
  - **Concept validation and Handbook/Doctrine development**
- **Very active Marine Corps Science Advisor community**
  - **Defining USMC S&T priorities**
- **MCWL Seabasing-related experimentation**
  - **SID is a major partner in this effort**
- **Platform deliveries**
  - **MLP, T-AKE, JHSV…continued USMC support of SSC and LCU Sustainment & SC(X) programs**
- **Maturing/delivered technologies**
  - **FNC Porfolio**

Questions?